

WEST**End of Result Set**

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L13: Entry 1 of 1

File: USPT

Sep 17, 2002

DOCUMENT-IDENTIFIER: US 6451153 B1

TITLE: Method of preparing a lignocellulosic material for the manufacture of a finished product

US Patent No. (1):
6451153Brief Summary Text (18):

The dicarboxylic anhydride may be selected from the group consisting of maleic anhydride, phthalic anhydride, succinic anhydride and tetrahydrophthalic anhydride, and the tricarboxylic anhydride may be trimellitic anhydride. Suitable solvents include methyl acetate, ethyl acetate, methylethyl ketone, benzene, trichloroethylene and dichloromethane, preferably dichloromethane.

Brief Summary Text (43):

In the first aspect of the invention, the lignocellulosic material is chemically modified by impregnating the lignocellulosic material with an impregnating composition comprising a dicarboxylic anhydride such as maleic anhydride, phthalic anhydride, succinic anhydride, or tetrahydrophthalic anhydride, or a tricarboxylic anhydride such as trimellitic anhydride, dissolved in a suitable solvent.

Brief Summary Text (46):

Other anhydrides such as propionic and butyric anhydride may be esterified to wood or other lignocellulosic material. The result of the reaction is effectively a lignocellulosic polyester, because in the cases of maleic anhydride, phthalic anhydride and succinic anhydride, a polymerisation takes place resulting in binding properties when the impregnated and dried material is subjected to heat and pressure, thereby complimenting the function of the binders used in this invention. In the case of maleic anhydride, the double bond opens allowing cross linking and in the case of phthalic anhydride, the ring opens initially, followed by polymerisation. The use of phthalic anhydride can result in a marked colour change whereas maleic anhydride gives rise to a pleasant woody colour.

Detailed Description Text (3):

Into 200 kg of dichloromethane is first dissolved 4,5 kg of maleic anhydride and following that 4,5 kg of Suprasec 5005 MDI and 1 kg of gum rosin, to give an impregnation mixture.

CLAIMS:

7. A method according to any one of claim 1 wherein the anhydride is selected from the group consisting of maleic anhydride, phthalic anhydride, succinic anhydride, tetrahydrophthalic anhydride and trimellitic anhydride.

WEST**End of Result Set**

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L14: Entry 1 of 1

File: USPT

Sep 17, 2002

DOCUMENT-IDENTIFIER: US 6451153 B1

TITLE: Method of preparing a lignocellulosic material for the manufacture of a finished product

US Patent No. (1):
6451153Brief Summary Text (7):

Examples of (documents which teach the use of anhydrides to treat a cellulosic material to which there is then applied a polymer, are U.S. Pat. Nos. 5,120,776; 5,385,754 which teaches a process for modifying lignocellulosic material by a chemical treatment method, which method comprises treating the lignocellulosic material with phthalic anhydride and a thermosetting resin selected from phenol-formaldehyde resins, urea formaldehyde resins and urethane resins, and then curing the phthalylated resin impregnated product so formed; CA 119:227002; and CA 120:135905.

Brief Summary Text (21):

The adhesion promoter is preferably selected from the group consisting of convertible resins such as petroleum resins, hydrocarbon resins and coumarone indene resins; thermoplastic rubbers; styrene butadiene resins; styrene acrylate resins; chlorinated rubbers; phenolic resins; solvent soluble thermoplastic resins such as polystyrene or polyvinyl chloride; lignocellulosic derived gums or rosins; solvent swellable celluloses such as methylhydroxypropylcellulose; phenol formaldehyde novolac resins; urethane elastomers; resinous tackifiers; bitumen; coal tar; asphalt and pitch; if necessary dissolved in a suitable non-aqueous solvent such as those listed above for the anhydrides.

Brief Summary Text (59):

The adhesion promoter is preferably selected from the group consisting of: convertible resins such as petroleum resins, hydrocarbon resins and coumarone indene resins. The petroleum resin, for example, may be derived from cracked oil C9 unsaturated monomers. The hydrocarbon resin may be an alkylated hydrocarbon resin or a hydroxy modified hydrocarbon resin; thermoplastic rubbers, e.g. Kraton D1102CS by Shell; styrene butadiene resins; styrene acrylate resins; chlorinated rubbers; phenolic resins; solvent soluble thermoplastic resins such as polystyrene or polyvinyl chloride; lignocellulosic derived gums or rosins; solvent swellable celluloses such as methylhydroxypropylcellulose, e.g. Culminal MHPC 2000S by Hercules Corporation; phenol formaldehyde novolac resins, e.g. Plyophen 602N or Varcum 3337 by PRP Resins Division of Sentrachem Ltd; bitumen, e.g. hard bitumen Mexphalte H80/90 by Shell, coal tar, asphalt or pitch; urethane elastomers; resinous tackifiers, e.g. Oulutac 20GPR by Forchem OY;

Brief Summary Text (90):

A novolac resin is a resin based upon phenol and formaldehyde and any of the variations and modified forms of such a resin, where the molar ratio of phenol to formaldehyde exceeds parity. The novolac resin may contain a catalyst, which on decomposition with heat gives rise to a source of formaldehyde, inducing the condensation of the polymer to form a three dimensional stable network with minimal shrinkage and which is hard, strong and insoluble. The resin is used in finely divided powder form and has the property of commencing to flow at approximately 100 to 130.degree. C., generally around 110.degree. C., followed by the decomposition of the catalyst, for example, hexamethylene tetramine. Example of suitable novolac resins are Schenectady Corporation of South Africa codes 6240 or 3174, or Plyophen 24-700 and Plyophen 602N or Varcum 3337 of PRP Resins Division of Sentrachem Ltd of South Africa.

Detailed Description Text (10):

A mixture of 1,75 kg of novolac phenol formaldehyde resin with a hexamethylenetetramine cross linking agent and a particle size of between 200 and 300 mesh, with 3,5 kg of irradiated polyethylene which has been gamma irradiated at an absorbed dosage of 20 kGy in an oxygenated atmosphere, is now applied to the damp fibres in the mixer. The novolac resin is made sticky by the dichloromethane and serves as an adhesion promoter to adhere the irradiated polyethylene to the surface of the wood fibres.

Detailed Description Text (21):

The thermosetting resin may be a phenolic resin (phenol formaldehyde resole resin), preferably a liquid phenolic resin, which can be polymerised at room or elevated temperatures. Examples of suitable phenolic resins include Celobond J 2027 L, J 2018, J 20/1096 L and J 20/1081 L from British Petroleum Company Plc, which may be catalysed with a catalyst such as Phencat 10 or more preferably latent catalyst Phencat P.R.P 382 from British Petroleum Plc. A phenol furfuryl resin catalysed with hexamethylenetetramine, or a blend of a phenolic resin with melamine formaldehyde or urea formaldehyde resins are also choices.

CLAIMS:

11. A method according to any one of claim 1 wherein the adhesion promoter is selected from the group consisting of petroleum resins, hydrocarbon resins, coumarone indene resins, thermoplastic rubbers, styrene butadiene resins, styrene acrylate resins, chlorinated rubbers, phenolic resins, solvent soluble thermoplastic resins, lignocellulosic derived gums or rosins, solvent swellable celluloses, phenol formaldehyde novolac resins, urethane elastomers, resinous tackifiers, bitumen, coal tar, asphalt, and pitch.

WEST

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L15: Entry 1 of 2

File: USPT

Sep 17, 2002

DOCUMENT-IDENTIFIER: US 6451153 B1

TITLE: Method of preparing a lignocellulosic material for the manufacture of a finished product

US Patent No. (1):
6451153Brief Summary Text (30):

In step (c) there may also be applied to the particles, with or without the dry powder novolac thermosetting resin, a wax either in dry particulate form or dissolved in a suitable solvent, so that the wax adheres to or impregnates the surfaces of the particles of lignocellulosic material.

Brief Summary Text (33):

According to a second aspect of the invention there is provided a process of making an article from particles of a lignocellulosic material treated by steps (a), (b), (c) and (d) above, which process includes the step of: (1) compressing the particles of lignocellulosic material with heating in a suitable press or mould to allow the resin present to polymerise, and to allow any wax or convertible resin present to melt and to flow and all to set to form the article.

Brief Summary Text (36):

According to a third aspect of the invention, there is provided a process of making a particle board from particles of a lignocellulosic material treated by steps (a), (b), (c) and (d) above, which process includes the steps of: (i) impregnating a sheet or sheets of a lignocellulosic material with a composition comprising a thermosetting resin, an extending liquid for the thermosetting resin and where necessary a catalyst for the thermosetting resin; (ii) recovering the extending liquid; (iii) placing on one or both sides of a layer of the particles of lignocellulosic material, the impregnated sheet or sheets of lignocellulosic material to form a composite; and (iv) compressing the composite with heating in a suitable press to allow the resin present to polymerise, and to allow any wax or convertible resin present to melt and flow, and to allow the thermosetting resin in the impregnated sheet or sheets to polymerise and to bond, and all to set to form the particle board.

Brief Summary Text (38):

According to a fourth aspect of the invention there is provided a process of making an article from particles of a lignocellulosic material treated by steps (a), (b), (c) and (d) above, which process includes the step of: (I) subjecting the particles of lignocellulosic material to an extrusion or injection moulding process with heating to allow the resin present to polymerise, and to allow any wax or convertible resin present to melt and to flow and all to set to form an article.

Brief Summary Text (92):

In step (c) there may also be applied to the particles with or without the novolac resin, a wax either in dry particulate form or dissolved in a suitable solvent so that the wax adheres to or impregnates the surfaces of the particles of lignocellulosic material

Brief Summary Text (93):

Examples of suitable waxes are code C15 by Sasol Limited South Africa, with the congealing point of 102.degree. C., or spray Wax 405F or 105F, having drop melting points greater than 115.degree. C., congealing points of 104.degree. C. and a penetrating index at 25.degree. C. of 1 maximum, a bromine value of 0,1 and a particle size of from 10 microns and an average molecular mass of 700 to 1300. The wax is added typically at the rate of from 0,5 to 10% of the mass of the lignocellulosic material

treated, more typically in the range of from 2 to 8%. The preferred waxes are aliphatic, highly crystalline, i.e. 85%+, linear and non branched, with the lower molecular weights being preferred, subject to a melt point being above 85.degree. C. and with an absence of amorphous zones.

Brief Summary Text (94):

When the lignocellulosic material so treated with wax and binder and from which the solvent has been removed, is subsequently pressed at temperatures in excess of 140.degree. C., usually between 140 and 250.degree. C. and at pressures of from 2 to 70 kg/cm.sup.2, the wax melts to give a very low viscosity liquid, i.e. 8 centipoise, and diffuses or migrates through the lignocellulosic material, imposing upon it waterproofness, excellent machining properties, and good surface finishes. The wax does not interfere with the subsequent application of either liquid coatings or laminates.

Detailed Description Text (13):

The second aspect of the invention is a process of making an article from particles of a lignocellulosic material treated by steps (a), (b), (c) and (d) above, which process includes the step of compressing the particles of lignocellulosic material with heating in a suitable press or mould to allow the resin present to polymerise, and to allow any wax or convertible resin present to melt and to flow and all to set to form the article.

Detailed Description Text (32):

In the next step of the process, the impregnated sheets of lignocellulosic material are positioned either at the bottom or top or on both bottom and top of a layer of the lignocellulosic particles to form a composite and the composite is then pressed under suitable conditions of temperature and pressure between the platens of a press, on either a continuous or discontinuous basis, whereupon the thermosetting resin in the impregnated sheets is polymerised, the resin in the lignocellulosic material polymerises, any wax or convertible resin present melts and flows and all set to form the particle board with the outer impregnated sheets firmly adhered to the core of the composite. These lend themselves to powder coating immediately the board exists the press and is at the requisite temperature.

CLAIMS:

20. A method according to any one of claim 1 wherein in step (c) there is also applied to the particles a wax either in dry particulate form or dissolved in a suitable solvent, so that the wax adheres to or impregnates the surfaces of the particles of lignocellulosic material.

21. A process of making a particle board from particles of a lignocellulosic material treated according to the method of any one of claim 1, which process includes the steps of: (i) impregnating a sheet or sheets of a lignocellulosic material with a composition comprising a thermosetting resin, an extending liquid for the thermosetting resin and where necessary a catalyst for the thermosetting resin; (ii) recovering the extending liquid; (iii) placing on one or both sides of a layer of the particles of lignocellulosic material, the impregnated sheet or sheets of lignocellulosic material to form a composite; and (iv) compressing the composite with heating in a suitable press to allow the resin present to polymerise, and to allow any wax or convertible resin present to melt and flow, and to allow the thermosetting resin in the impregnated sheet or sheets to polymerise and to bond, and all to set to form the particle board.

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L19: Entry 1 of 1

File: USPT

Sep 17, 2002

DOCUMENT-IDENTIFIER: US 6451153 B1

TITLE: Method of preparing a lignocellulosic material for the manufacture of a finished product

US Patent No. (1):
6451153

Brief Summary Text (3):

It is well known to manufacture particle board and other composites from chips, particles, fibres, veneers, flakes, strands or flours of natural fibrous plant materials such as wood. Such boards are most frequently made by using formaldehyde condensation resins such as urea, melamine or resole phenolics as binders. Polyureas and isocyanates are also used. It is desirable that free formaldehyde or other binder related toxic volatiles should be avoided, that swelling due to water wetting be minimised thereby increasing water resistance, that the binder system used should be water proof, that the surface integrity of the board should be such as to promote ease of finishing, that the strength and consistency of the composite lend itself to thin calliper board production, with strength properties comparable to plywood, and that the process should not be particle size critical as is the case with binder spray-on, followed by shear or "wet wipe" binder distribution. Further desirable properties are good machinability, good nail and screw holding and good edge finishing.

Detailed Description Text (21):

The thermosetting resin may be a phenolic resin (phenol formaldehyde resole resin), preferably a liquid phenolic resin, which can be polymerised at room or elevated temperatures. Examples of suitable phenolic resins include Celobond J 2027 L, J 2018, J 20/1096 L and J 20/1081 L from British Petroleum Company Plc, which may be catalysed with a catalyst such as Phencat 10 or more preferably latent catalyst Phencat P.R.P 382 from British Petroleum Plc. A phenol furfuryl resin catalysed with hexamethylenetetramine, or a blend of a phenolic resin with melamine formaldehyde or urea formaldehyde resins are also choices.

WEST**End of Result Set**

Generate Collection

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L20: Entry 1 of 1

File: USPT

Sep 17, 2002

DOCUMENT-IDENTIFIER: US 6451153 B1

TITLE: Method of preparing a lignocellulosic material for the manufacture of a finished product

US Patent No. (1):
6451153Brief Summary Text (21):

The adhesion promoter is preferably selected from the group consisting of convertible resins such as petroleum resins, hydrocarbon resins and coumarone indene resins; thermoplastic rubbers; styrene butadiene resins; styrene acrylate resins; chlorinated rubbers; phenolic resins; solvent soluble thermoplastic resins such as polystyrene or polyvinyl chloride; lignocellulosic derived gums or rosins; solvent swellable celluloses such as methylhydroxypropylcellulose; phenol formaldehyde novolac resins; urethane elastomers; resinous tackifiers; bitumen; coal tar; asphalt and pitch; if necessary dissolved in a suitable non-aqueous solvent such as those listed above for the anhydrides.

Brief Summary Text (29):

In step (c), there may also be applied to the particles a dry powder novolac thermosetting resin and if necessary a catalyst therefor so that the dry powder novolac thermosetting resin adheres to the surfaces of the particles of lignocellulosic material.

Brief Summary Text (30):

In step (c) there may also be applied to the particles, with or without the dry powder novolac thermosetting resin, a wax either in dry particulate form or dissolved in a suitable solvent, so that the wax adheres to or impregnates the surfaces of the particles of lignocellulosic material.

Brief Summary Text (59):

The adhesion promoter is preferably selected from the group consisting of: convertible resins such as petroleum resins, hydrocarbon resins and coumarone indene resins. The petroleum resin, for example, may be derived from cracked oil C9 unsaturated monomers. The hydrocarbon resin may be an alkylated hydrocarbon resin or a hydroxy modified hydrocarbon resin; thermoplastic rubbers, e.g. Kraton D1102CS by Shell; styrene butadiene resins; styrene acrylate resins; chlorinated rubbers; phenolic resins; solvent soluble thermoplastic resins such as polystyrene or polyvinyl chloride; lignocellulosic derived gums or rosins; solvent swellable celluloses such as methylhydroxypropylcellulose, e.g. Culminal MHPC 2000S by Hercules Corporation; phenol formaldehyde novolac resins, e.g. Plyophen 602N or Varcum 3337 by PRP Resins Division of Sentrachem Ltd; bitumen, e.g. hard bitumen Mexphalte H80/90 by Shell, coal tar, asphalt or pitch; urethane elastomers; resinous tackifiers, e.g. Oulutac 20GPR by Forchem OY;

Brief Summary Text (86):

The isocyanate resins are fully soluble in dichloromethane and react with the hydroxyl groups on the cellulose and hemi cellulose molecules of the lignocellulosic material to form a wood ester. In this way they form a chemical bond adhesion rather than a cohesive adhesion. They are therefore effective in contributing not only to a reduction in water sensitivity but also to superior binding. In addition, they scavenge any carboxyl groups which are residual from the carboxylic acid derived from the anhydride, and also. link with the hydroxyl group on the phenol molecule that may be residual when a novolac resin is used, or with the hydroxyl or other grafted groups on irradiated

polyethylene molecules when irradiated polyethylenes are used, particularly those irradiated in the presence of oxygen which propagates the formation of hydroxyl groups or similar reactive groups that may be grafted by the fluorination of polypropylene or polyethylene. The isocyanate resins lend themselves to synergistic binding of composites and to the propagation of superior mechanical properties by a three cornered linkage with the residue of the anhydrides, the hydroxyl groups on the lignocellulosic material itself and with synergistic binders such as the novolacs or irradiated polyethylenes or others that contain groups such as hydroxyl or carboxyl that react with the NCO groups of the isocyanates.

Brief Summary Text (89):

In step (c), there may also be applied to the particles a dry powder novolac thermosetting resin and if necessary a catalyst therefor so that the dry powder novolac thermosetting resin adheres to the surfaces of the particles of lignocellulosic material.

Brief Summary Text (90):

A novolac resin is a resin based upon phenol and formaldehyde and any of the variations and modified forms of such a resin, where the molar ratio of phenol to formaldehyde exceeds parity. The novolac resin may contain a catalyst, which on decomposition with heat gives rise to a source of formaldehyde, inducing the condensation of the polymer to form a three dimensional stable network with minimal shrinkage and which is hard, strong and insoluble. The resin is used in finely divided powder form and has the property of commencing to flow at approximately 100 to 130.degree. C., generally around 110.degree. C., followed by the decomposition of the catalyst, for example, hexamethylene tetramine. Example of suitable novolac resins are Schenectady Corporation of South Africa codes 6240 or 3174, or Plyophen 24-700 and Plyophen 602N or Varcum 3337 of PRP Resins Division of Sentrachem Ltd of South Africa.

Brief Summary Text (91):

After the dry powder novolac thermosetting resin has adhered to the surface of the lignocellulosic material, the solvent from the impregnating composition may be recovered for reuse or otherwise removed. This leaves the lignocellulosic material with a resinated surface which is dry and in a latent condition, ready for processing to form a finished product.

Brief Summary Text (92):

In step (c) there may also be applied to the particles with or without the novolac resin, a wax either in dry particulate form or dissolved in a suitable solvent so that the wax adheres to or impregnates the surfaces of the particles of lignocellulosic material

Detailed Description Text (10):

A mixture of 1,75 kg of novolac phenol formaldehyde resin with a hexamethylenetetramine cross linking agent and a particle size of between 200 and 300 mesh, with 3,5 kg of irradiated polyethylene which has been gamma irradiated at an absorbed dosage of 20 kGy in an oxygenated atmosphere, is now applied to the damp fibres in the mixer. The novolac resin is made sticky by the dichloromethane and serves as an adhesion promoter to adhere the irradiated polyethylene to the surface of the wood fibres.

CLAIMS:

11. A method according to any one of claim 1 wherein the adhesion promoter is selected from the group consisting of petroleum resins, hydrocarbon resins, coumarone indene resins, thermoplastic rubbers, styrene butadiene resins, styrene acrylate resins, chlorinated rubbers, phenolic resins, solvent soluble thermoplastic resins, lignocellulosic derived gums or rosins, solvent swellable celluloses, phenol formaldehyde novolac resins, urethane elastomers, resinous tackifiers, bitumen, coal tar, asphalt, and pitch.

19. A method according to any one of claim 1 wherein in step (c), there is also applied to the particles a dry powder novolac thermosetting resin and if necessary a catalyst therefor so that the dry powder novolac thermosetting resin adheres to the surfaces of the particles of lignocellulosic material.

WEST**End of Result Set**☐ **Generate Collection** **Print**

L23: Entry 1 of 1

File: USPT

Sep 26, 2000

DOCUMENT-IDENTIFIER: US 6123795 A

TITLE: Method of preparing a sheet of a lignocellulosic material for the manufacture of a finished product and method of manufacture of a finished product

US Patent No. (1):
6123795Brief Summary Text (21):

(i) a composition for the chemical modification of the lignocellulosic material comprising a dicarboxylic anhydride or a tricarboxylic anhydride selected from the group consisting of maleic anhydride, phthalic anhydride, succinic anhydride, tetrahydrophthalic anhydride and trimellitic anhydride dissolved in a suitable non-aqueous solvent selected from dichloromethane and liquid carbondioxide, and

Detailed Description Text (5):

In the first aspect of the invention, the lignocellulosic material is chemically modified by impregnating the lignocellulosic material with an impregnating composition comprising a dicarboxylic anhydride such as maleic anhydride, phthalic anhydride, succinic anhydride, or tetrahydrophthalic anhydride, or a tricarboxylic anhydride such as trimellitic anhydride, dissolved in a suitable solvent.

Detailed Description Text (13):

Other anhydrides such as propionic and butyric anhydride may be esterified to wood or other lignocellulosic material. The result of the reaction is effectively a lignocellulosic polyester, because in the cases of maleic anhydride, phthalic anhydride and succinic anhydride, a polymerisation takes place resulting in binding properties when the impregnated and dried material is subjected to heat and pressure, thereby complementing the function of the resin used in this invention. In the case of maleic anhydride, the double bond opens allowing cross linking and in the case of phthalic anhydride, the ring opens initially, followed by polymerisation.

Detailed Description Text (76):

An example is a ceiling board comprising 250 g/m.sup.2 high bulk chip recycled paper on either side of a foam core. The paper is modified with 15% Suprasec 5005 by ICI and 6% maleic anhydride on the weight of the paper and has a nominal thickness of 0,5 mm per sheet with an interlayer of 6 mm of foam between the sheets, this foam having a density of 40 g/mm thickness/m.sup.2. The MDI foam may optionally be based upon Suprasec 5005 by ICI 50% and Polyol 826 by Industrial Urethanes, South Africa, or a phenolic closed cell foam, or Cellobond K in situ pourable by BP Chemicals Ltd., UK.

CLAIMS:

1. A method of preparing a sheet of lignocellulosic material for the manufacture of a finished product which preparation method includes the steps of:

(a) impregnating the sheet of the lignocellulosic material with an impregnating composition, optionally in excess and comprising:

(i) a composition for the chemical modification of the lignocellulosic material comprising a dicarboxylic anhydride or a tricarboxylic anhydride selected from the group consisting of maleic anhydride, phthalic anhydride, succinic anhydride, tetrahydrophthalic anhydride and trimellitic anhydride dissolved in a non-aqueous solvent selected from dichloromethane and liquid carbondioxide, and

(ii) a composition for resinating the lignocellulosic material comprising an isocyanate thermosetting resin dissolved in a non-aqueous solvent selected from dichloromethane and liquid carbondioxide,

(b) removing from the impregnated lignocellulosic material any excess of the impregnating composition; and

(c) removing the non-aqueous solvent or solvents.

WEST**End of Result Set**

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L26: Entry 1 of 1

File: USPT

Sep 26, 2000

DOCUMENT-IDENTIFIER: US 6123795 A

TITLE: Method of preparing a sheet of a lignocellulosic material for the manufacture of a finished product and method of manufacture of a finished product

US Patent No. (1):
6123795Brief Summary Text (52):

Further alternatively, the adhesive material may be a combination of a phenol formaldehyde resole resin, a catalyst for the resin, a blowing agent and an emulsifying agent, applied between two adjacent sheets of the lignocellulosic material to produce a phenolic foam between the two adjacent sheets of lignocellulosic material, and to adhere the two adjacent sheets of the lignocellulosic material to each other to form the layered product.

Detailed Description Text (78):

In another alternative a combination comprising a phenol formaldehyde resole resin, a catalyst for the resin, a blowing agent and an emulsifying agent, is applied between each pair of adjacent sheets to form a phenolic foam between the adjacent sheets and to adhere the two or more sheets to one another to form a layered product.

CLAIMS:

14. A method according to claim 4 wherein the adhesive material is a combination of a phenol formaldehyde resole resin, a catalyst for the resin, a blowing agent and an emulsifying agent, applied between two adjacent sheets of the lignocellulosic material to produce a phenolic foam between the two adjacent sheets of lignocellulosic material, and to adhere the two adjacent sheets of the lignocellulosic material to each other to form the layered product.

WEST Search History

DATE: Tuesday, August 19, 2003

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DB=USPT,PGPB,JPAB,EPAB,DWPI; THES=ASSIGNEE; PLUR=YES;
OP=ADJ

L31	L30 and maleic.clm.	1	L31
L30	L28 and phenol formaldehyde.clm.	6	L30
L29	L28 and phenol formaldehyde	8	L29
L28	lignocellulos\$4.clm. and wax.clm.	23	L28
L27	L21 and novolac	0	L27
L26	L21 and resole	1	L26
L25	L21 and emulsion	1	L25
L24	L21 and wax	0	L24
L23	L21 and maleic anhydride	1	L23
L22	L21 and maleic acid	0	L22
L21	6123795.pn.	2	L21
L20	L11 and novolac	1	L20
L19	L11 and resole	1	L19
L18	L11 and polybutene	0	L18
L17	L11 and emulsion	0	L17
L16	L11 and wax emulsion	0	L16
L15	L11 and wax	2	L15
L14	L11 and phenol formaldehyde	1	L14
L13	L11 and maleic anhydride	1	L13
L12	L11 and maleic acid	0	L12
L11	6451153.pn.	2	L11
L10	L9 and maleic	0	L10
L9	5385754.pn.	2	L9
L8	phenolic bonded lignocellulos\$4	1	L8
L7	phenolic bonded wood	0	L7
L6	maleic.clm. and phenol formaldehyde.clm. and lignocellulos\$4.clm.	3	L6
L5	L4 same lignocellulos\$4	4	L5
L4	maleic with phenol formaldehyde	874	L4
L3	maleic same phenol formaldehyde	1285	L3
L2	L1 and phenol formaldehyde	12	L2
L1	lignocellulos\$4 same maleic	54	L1

END OF SEARCH HISTORY

WEST Search History

DATE: Tuesday, August 19, 2003

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result set

*DB=USPT,PGPB,JPAB,EPAB,DWPI; THES=ASSIGNEE; PLUR=YES;
OP=ADJ*

L6	maleic.clm. and phenol formaldehyde.clm. and lignocellulos\$4.clm.	3	L6
L5	L4 same lignocellulos\$4	4	L5
L4	maleic with phenol formaldehyde	874	L4
L3	maleic same phenol formaldehyde	1285	L3
L2	L1 and phenol formaldehyde	12	L2
L1	lignocellulos\$4 same maleic	54	L1

END OF SEARCH HISTORY